AD-A103 511 ARMY ENGINEER DISTRICT NORFOLK VA F/G 13/13
NATIONAL DAM SAFETY PROGRAM. LAKESIDE DAM (INVENTORY NUMBER VA --ETC(U)
OCT 80 J A WALSH

UNCLASSIFIED NL

POTOMAC RIVER BASIN

Name Of Dam: LAKESIDE
Location: FREDERICK COUNTY VIRGINIA
Inventory Number: VA 06920

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

PREPARED BY
NORFOLK DISTRICT CORPS OF ENGINEERS
803 FRONT STREET
NORFOLK, VIRGINIA 23510

IN CONJUNCTION WITH

COMMONWEALTH OF VIRGINIA
STATE WATER CONTROL BOARD

OCTOBER 1980

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A103 511	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* Phase I Inspection Report National Dam Safety Program	5. TYPE OF REPORT & PERIOD COVERED Final
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s)	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U. S. Army Engineering District 803 Front Street Norfolk, Virginia 23510	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS	12. REPORT DATE October 1980
	13. NUMBER OF PAGES 54
14. MONITORING AGENCY NAME & ADDRESS *(if different from Controlling Office)* National Dam Safety Program. Lakeside Dam (Inventory Number VA 06920), Potomac River Basin, Frederick County, Virginia. Phase I Inspection Report.	15. SECURITY CLASS. *(of this report)* Unclassified
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES
Copies are obtainable from National Technical Information Service, Springfield, Virginia 22151

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*
Dams - VA
National Dam Safety Program Phase I
Dam Safety
Dam Inspection

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

20. Abstract

Pursuant to Public Law 92-367, Phase I Inspection Reports are prepared under guidance contained in the recommended guidelines for safety inspection of dams, published by the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I Inspection is to indentify expeditiously those dams which may pose hazards to human life or property. The assessment of the general conditions of the dam is based upon available data and visual inspection. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

Based upon the field conditions at the time of the field inspection and all available engineering data, the Phase I report addresses the hydraulic, hydrologic, geologic, geotechnic, and structural aspects of the dam. The engineering techniques employed give a reasonably accurate assessment of the conditions of the dam. It should be realized that certain engineering aspects cannot be fully analyzed during a Phase I inspection. Assessment and remedial measures in the report include the requirements of additional indepth study when necessary.

Phase I reports include project information of the dam appurtenenances, all existing engineering data, operational procedures, hydraulic/hydrologic data of the watershed, dam stability, visual inspection report and an assessment including required remedial measures.

POTOMAC RIVER BASIN

NAME OF DAM: LAKESIDE
LOCATION: FREDERICK COUNTY, VIRGINIA
INVENTORY NUMBER: VA 06920

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

PREPARED BY
NORFOLK DISTRICT CORPS OF ENGINEERS
IN CONJUNCTION WITH
COMMONWEALTH OF VIRGINIA
STATE WATER CONTROL BOARD
803 FRONT STREET
NORFOLK, VIRGINIA 23510

December 1980

TABLE OF CONTENTS

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations testing, and detailed computational evaluations are beyound the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the design flood should not be interpreted as necessarily posing a highly inadequate condition. The design flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

BRIEF ASSESSMENT OF DAM

Name of Dam:	Lakeside Dam
State:	Virginia
Location:	Frederick County
USGS Quad Sheet:	Stephens City
Stream:	Tributary of Opequon Creek
Date of Inspection:	30 October 1980

The Lakeside Dam is an earthen embankment about 428 feet long and 14.1 feet high. The dam is owned and maintained by the DANAC Real Estate Investment Corporation and the Metropolitan Federal Service Corporation. The dam is classified as a small dam with a significant hazard classification. The spillway is a riprap lined earthen side channel spillway located at the right abutment. This reservoir is used for recreation.

Based on criteria established by the Department of the Army, Office of the Chief of Engineers (OCE), the Spillway Design Flood (SDF) is the 100 year flood. The spillway will satisfactorily pass the 100 Year Flood, and will also pass 100 percent of the Probable Maximum Flood without overtopping the dam. Therefore the spillway is adjudged as adequate.

The visual inspection revealed no problems or remedial measures in need of immediate attention. There is no regular maintenance operation program or warning system, and it is recommended that a maintenance program and a warning system be established. The maintenance items listed in Section 7.2 should be accomplished as a part of the regular maintenance program within the next 12 months.

Submitted By:

JAMES A. WALSH, P. E.
Chief, Design Branch

Approved:

DOUGLAS L. HALLER
Colonel Corps of Engineers
District Engineer

Recommended By

JACK G. STARR
Chief, Engineering Division

Date:

CREST & DOWNSTREAM FACE

RESERVOIR AREA

OVERALL VIEWS OF LAKESIDE DAM

30 OCTOBER 1980

SECTION 1

PROJECT INFORMATION

1.1 GENERAL:

1.1.1 Authority: Public Law 92-367, 8 August 1972, authorized the Secretary of the Army, through the Corps of Engineers to initiate a national program for safety inspection of dams throughout the United States. The Norfolk District has been assigned the responsibility of supervising the inspection of dams in the Commonwealth of Virginia.

1.1.2 Purpose of Inspection: The purpose is to conduct a Phase I inspection according to the Recommended Guidelines for Safety Inspection of Dams (Reference 1, Appendix IV). The main responsibility is to expeditiously identify those dams which may be a potential hazard to human life and property.

1.2 Project Description:

1.2.1 Dam and Appurtenances: Lakeside Dam is an earthen embankment dam about 428 feet long and 14.1 feet high. The crest of the dam is 16 feet wide with a crest elevation of 100 TBM*. The upstream slope is 4.5 horizontal to 1 vertical (4.5H:1V). The downstream slope is 4H:1V.

There is reported to be a clay core in the dam but it is unknown if it is keyed into the foundation or whether or not there is a drainage system. There are no foundation drain outlets. Riprap has been placed on the upstream slope, the limits of which are ill defined and which have failed in places.

The spillway is a side channel spillway partially lined with riprap, located at the right abutment. The width of the control section of the spillway is 72 feet and has an elevation of about 96.5 TBM.

There is a pipe of unknown diameter passing through the dam for dewatering the reservoir. The intake is located in the reservoir and the outlet is located at the downstream toe of the dam near the left abutment but this was covered by earth and its exact location is unknown.

*TBM based on bench mark noted on Plate II at elevation 105.2

1.2.2 Location: Lakeside Dam is located 1-1/2 miles northeast of Stephens City, Virginia in the Lakeside Subdivision.

1.2.3 Size Classification: The dam is classified as a small size structure because of storage capacity.

1.2.4 Hazard Classification: The dam is located in the Lakeside Subdivision. A flood wave from a dam failure could possibly create economic losses and endanger some lives, therefore, a significant hazard classification is given to this structure according to guidelines contained in Section 2.1.2 of Reference 1, Appendix IV. The hazard classification used to categorize this dam is a function of location only and has nothing to do with its stability or probability of failure.

1.2.5 Ownership: Lakeside Dam is jointly owned by the DANAC Real Estate Investment Corporation and Metropolitan Federal Service Corporation of Bethesda, Maryland.

1.2.6 Purpose: The dam is used for recreation.

1.2.7 Design and Construction History: The dam was designed with assistance from the Soil Conservation Service. Construction of the dam was completed in 1969 by the Neff Construction Co. of Stephens City, Virginia.

1.2.8 Normal Operational Procedures: Water passes automatically through the spillway as the reservoir rises above the crest of the spillway.

1.3 Pertinent Data:

1.3.1 Drainage Area: The dam controls a drainage area of 0.10 square miles.

1.3.2 Discharge at Dam Site: Maximum flood unknown.

Pool level at top of dam - Spillway ---------- 1320 cfs

1.3.3 Dam and Reservoir Data: Pertinent data on the dam and reservoir are shown in the following table:

TABLE 1.1 DAM AND RESERVOIR DATA

Item	Elevation feet TBM	Reservoir Capacity Area, acres	Acre, feet	Watershed, inches	Length (Miles)
Top of Dam	100.0*	9.5	65	12.6	.23
Spillway Crest	96.5	6.5	32.5	6.3	.17
Down-stream Toe of Dam	85.9	--	--	--	--

*The low point in the dam crest was used for Table 1.1, See Plate 2, Appendix 1 for elevations along crest of dam.

SECTION 2

ENGINEERING DATA

2.1 Design: There is no known design information.*

2.2 Construction: There are no known construction records.

2.3 Evaluation: There is insufficient information to evaluate foundation conditions and embankment stability.

*The only information that was available from the Soil Conservation Service was that there was a clay core placed in the dam.

SECTION 3

VISUAL INSPECTION

3.1 Findings:

3.1.1 General: The results of the inspection on 30 October 1980, are recorded in Appendix III. At the time of the inspection, the weather was sunny and clear, with a temperature of 55°F. Ground conditions were moist. The pool elevation was approximately 94.8 TBM. The spillway is a partially riprapped channel at the right abutment; no flow was passing through it at the time of the inspection. The outlet of the low level drain pipe is buried and is assumed to be inoperable. There are no known prior inspection reports.

3.1.2 Embankment: The embankment is in good condition. A sketch showing a plan view and cross section is provided on Plate I, Appendix I. A crest profile is given on Plate II, Appendix I. Overall views of the crest and downstream face of the dam and of the reservoir area are provided at the beginning of the report.

There are no signs of surface cracks, unusual movement, sloughing, or misalignment. Wave erosion is forming a bench on the upstream face of the dam, particularly in the area free of shoreline vegetation. The crest of the dam has some tire ruts and there is a trail bike path on the left downstream face of the dam. The riprap has failed in the area of the wave erosion bench, and elsewhere has deteriorated.

A marshy area of considerable extent exists beyond the toe of the dam on the lefthand side, and there are several separate seeps or springs evident within or adjacent to this area, as indicated on the plan view. One of these, with a flow estimated to be 1 to 2 gpm, is located a short distance downhill from the "T" pipe valve stem, and may be seepage from the low level drain pipe. This valve stem is reported to have been damaged by a bulldozer working on the site.

There are scattered poplar and willow saplings and trees on the upstream face of the dam, and some light brush. There are no known foundation drains.

3.1.3 Drawdown Outlet Works: The lake is reported to have a low level drain pipe of unknown diameter. A "T" pipe stem which is presumed to control the outlet valve to this low level drain is presently askew. The outlet as well as the "T" pipe stem's connection to it are presently buried, although the depression in the immediate vicinity suggests that an effort may have been made to uncover the system with a view to restoring it. There is a 14-foot section of 4-inch pipe lying on the surface a short distance below the valve stem. It is not known whether this may have perhaps originally been part of the low level drain system.

3.1.4 Spillway: The spillway is a earthen side channel at the right abutment, the control section is partially riprapped. Its approach is partially blocked by cattails and an old boat. The discharge channel is a relatively narrow ditch generally overgrown with tall grass, which is somewhat eroded in places. The erosion in the channel is particularly apparent as it approaches the ditch, actually an intermittent stream, which parallels the road downstream from the dam.

3.1.5 Instrumentation: There is no instrumentation on the dam.

3.1.6 Reservoir Area: The reservoir area is characterized by gentle slopes and open fields. A tennis court and picnic shelter are located on the righthand side of the lake, and there is a development of townhouses beyond its upper end. There are no signs of reservoir slope failure or of serious shoreline erosion.

3.1.7 Downstream Channel: There is no clearly defined tailwater for this dam. Seepage from the marshy area and discharge through the spillway flows into an intermittent stream beside the road which is located dowsntream of and roughly parallel to the dam. This trapezoidal stream channel is clear of obstructions. There is a subdivision beyond the road, with several homes that could be affected in the event that the dam should fail.

3.2 Evaluation: Overall, the dam appears to be in good condition. However, the inspection revealed certain preventive maintenance items which should be scheduled as part of an annual maintenance program. These are:

a. The outlet for the low level drain should be repaired, to return this system to an operable condition.

b. The marshy area beyond the toe of the dam should be monitored for marked increases in seepage, muddy flows, or boils. Should these conditions be noted, a professional geotechnical engineer should be consulted. Observation of the area should be made at least at quarterly intervals, and during any period of exceptionally high water.

c. All trees and saplings less than three inches in diameter on the upstream face of the dam should be cut even with the ground to prevent the eventual deterioration of the dam by root systems. All trees greater than three inches in diameter should be removed along with the root system. The subsequent hole should be filled with wall compacted material and seeded or sodded.

d. Place compacted fill in the area of the upstream face eroded by wave action, reseed, and protect with riprap at the wave line area.

e. Place compacted fill in all rutted areas, and grade so that the water will run off. Reseed as appropriate.

f. Reseed bare areas of present or potential erosion such as the bike trails to prevent progressive deterioration.

g. Remove the old boat in the approach to the spillway, and keep the area clear of vegetation.

h. Continue mowing the dam area to maintain the grass cover and prevent the encroachment of underbrush.

i. Install a staff gage, which is a staff, rod, or post with elevations indicated on it permanently mounted in a lake to show the depth of the water. It should be of sufficient height to indicate the depth of flow through the spillway.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Procedures: The normal storage pool elevation is about 96.5 feet TBM, which is the crest of the spillway. Water passes automatically over the spillway as the water level in the reservoir rises above the spillway crest. A pipe of unknown diameter at a low level in the reservoir is provided to lower the reservoir below normal pool. At this time the outlet to this pipe is buried and it is assumed to be inoperable.

4.2 Maintenance: There is no maintenance program for Lakeside Dam.

4.3 Warning System: At this time there is no warning system or evacuation plan for Lakeside Dam.

4.4 Evaluation: The dam does not require an elaborate operation and maintenance program. However, a program should be initiated to help detect and correct problems as they occur. An emergency operation and warning plan should be developed. It is recommended that formal emergency procedures be prepared and furnished to responsible persons of DANAC Real Estate Investment Corporation, Metropolitan Federal Service Corporation, and Frederick County, Virginia. This should include:

a. How to operate the dam during an emergency.

b. Who to notify, including public officials, in case evacuation from the downstream area becomes necessary.

The local office of Energy and Emergency Services can assist in the preparation of an Emergency Warning Plan.

The owner of the dam, being essentially an absentee owner, should also designate a local responsible person to periodically monitor the dam for any unusual conditions. This designated person should be familiar with the emergency procedures implemented.

SECTION 5

HYDRAULIC/HYDROLOGIC DATA

5.1 Design: None were available.

5.2 Hydrologic Records: None were available.

5.3 Flood Experience: Unknown.

5.4 Flood Potential: The 100 year flood, 1/2 PMF and PMF were developed by use of the HEC-1 computer program (Reference 2, Appendix IV) and routed through the reservoir by use of the NWS-Dambreak computer program (Reference 3, Appendix IV). Clark's TC and R coefficients for the local drainage area were estimated from basin characteristics. The appropriate rainfalls applied to the developed unit hydrograph were obtained from National Weather Service publications (Reference 4 and 5, Appendix IV).

5.5 Reservoir Regulation: Pertinent dam and reservoir data are shown in Table 1.1.

Water passes automatically through the spillway as water rises above the spillway crest.

The storage curve was developed based on areas obtained from a U. S. Geological Survey Quadrangle Map. Rating curves were developed for the spillway. In routing hydrographs through the reservoir, it was assumed that initial pool elevation was at 96.5 TBM.

5.6 Overtopping Potential: The probable rise in the reservoir and other pertinent information on reservoir performance is shown in the following table:

Table 5.1 RESERVOIR PERFORMANCE
DAM PERFORMANCE

Item	Normal Flow	Hydrograph 100 Year2/	1/2 PMF	PMF1/
Peak flow c.f.s.				
Inflow	1	211	466	932
Outflow	1	149	364	757
Maximum elevation ft. TBM	96.5	97.2	97.9	98.9
Spillway Section (el 96.5 TBM)				
Depth of flow, ft	-	.7	1.4	2.4
Duration, hours	-	10	17	17
Velocity, fps 3/	-	3.9	5.5	7.17
Tailwater elevation ft., TBM4/	-	-	-	-

1/ The PMF is an estimate of flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region.

2/ The 100 Year Flood has one chance in 100 of being exceeded in any given year.

3/ Critical velocity.

4/ Flow through the spillway discharge channel discharges well below the dam thus inhibiting a tailwater.

5.7 Reservoir Emptying Potential: A low level outlet does exist for the dam but the outlet and valve were buried and it is assumed to be inoperable.

5.8 Evaluation: Based on the size (small) and hazard classification (significant) the recommended Spillway Design Flood is the 100 Year Flood to the 1/2 PMF. Based on the risk involved in this project, the 100 Year Flood has been selected as the SDF. The spillway will pass 100% of the PMF without overtopping the dam.

Conclusions pertain to present day conditions. The effect of future development on the hydrology has not been considered.

SECTION 6

DAM STABILITY

6.1 Foundation and Abutments: There is no information available on the foundation conditions, except what can be inferred from geologic studies of the area, which lies within the Ridge and Valley geologic province. A description of the area geology is presented in Appendix III as part of the Field Observations. The vicinity of the dam is underlain by the Martinsburg Formation, which consists of brownish, fissile shale and thinly laminated, fine-grained sandstone. Outcrops in the area between the toe of the dam and the road noted during the inspection were of the brown shale, with a strike of N 35 degrees E and a nearly vertical dip. The sandstone typical of the Martinsburg Formation was noted only in the form of isolated boulders.

Although there are no records documenting the construction of the dam, good engineering practice would have been to excavate down to the shale bedrock, either over the entire vase area of the dam or at least for a cutoff trench section. This would be facilitated by the fact that the bedrock should be at a relatively shallow depth, judging from the presence of nearby outcrops. However, it is not known if this were actually done to key the dam into its foundation, or if any form of drainage system was incorporated into the design. The soils in the area appear to be residual silts of medium plasticity formed by weathering of the underlying rock, which should be relatively impervious and stable. Foundation conditions for the dam should be generally good, particularly if in fact the dam is keyed into the shale bedrock.

6.2 Embankment:

6.2.1 Material: Except for the fact that the dam is reported to have a clay core, there is no information available on the nature of the embankment materials. It is likely that the source of borrow for the dam was located in the vicintiy of the lake, with a considerable portion probably coming from within the area presently covered by it. As noted, the area soils appear to be residual silts of medium plasticity.

6.2.2 Stability: There are no available stability calculations. The dam is 14.1 feet high and 16 feet wide at the crest. A dirt road traverses the crest of the dam. The upstream slope is 4.5H:1V and the downstream slope is 4H:1V. The dam is not presently subjected to a sudden drawdown because the low level drain appears to be inoperable. The existing pool is approximately 1.6 feet below maximum control storage pool which is at the crest of the spillway. The dam has experienced the maximum control storage pool with no apparent side effects.

According to the guidelines presented in Design of Small Dams, U. S. Department of the Interior, Bureau of Reclamation, the slopes recommended for a homogeneous or modified-homogeneous small dam of similar material not subjected to a rapid drawdown are 3.5H:1V upstream and 2.5H:1V downstream. For a similar dam subjected to a rapid drawdown, the recommended slopes are 4H:1V upstream and 2.5:1V downstream. The recommended width is 17 feet. Based on these guidelines, the Lakeside Dam has adequate slopes and a width slightly less than recommended, which should not be critical, especially in view of the fact that the slopes are more than adequate.

6.2.3 Seismic Stability: The dam is located in Seismic Zone 2. Therefore, according to the Recommended Guidelines for Safety Inspection of Dams, the dam is considered to have no hazard from earthquakes provided static stability conditions are satisfactory and conventional safety margins exist.

6.3 Evaluation: There is insufficient information to adequately evaluate the stability of the dam. However, the visual inspection revealed no apparent instability. Based on the visual inspection, the foundation is considered sound. Based on the Bureau of Reclamation guidelines, the slopes are adequate, and the width is slightly less than the recommended width. The embankment is considered stable during both normal pool and maximum storage pool operations. In addition, overtopping is not a problem because the spillway will pass all storms up to and including the PMF without overtopping the dam. Stability calculations are not required.

SECTION 7

ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment: The available engineering data is inadequate. The visual inspection revealed no findings that proved the dam to be unsound. There is no regular maintenance operations program formalized and no emergency operation and warning plan. Overall, the dam is in good condition and there is no immediate need for remedial measures. Corps guidelines indicate the appropriate Spillway Design Flood (SDF) for a small size and significant hazard dam is the 100 Year Flood. The spillway will pass 100 percent of the 100 Year Flood and also the PMF without overtopping the dam, and therefore the capacity of the spillway is adjudged adequate.

A stability check of the dam is not required.

7.2 Recommended Remedial Measures: It is recommended that a regular maintenace operation program be formalized for future reference. A formal emergency procedure should be prepared and furnished to all operating personnel. This should include how to operate the dam during an emergency, and who to notify including public officials, in case evacuation from the downstream area is necessary. The owner of the dam should also designate a local responsible person to periodically monitor the dam for any unusual conditions. The person designated should be thoroughly familiar with any emergency procedures implemented. Also, the inspection revealed the following maintenance items that should be scheduled by the owner during a regualr maintence period within the next 12 months:

a. The outlet for the low level drain should be repaired, to return this system to an operable condition.

b. The marshy area beyond the toe of the dam should be monitored for marked increases in seepage, muddy flows, or boils. Should these conditions be noted, a professional geotechnical engineer should be consulted. Observation of the area should be made at least at quarterly intervals, and during any period of exceptionally high water.

c. All trees and saplings less than three inches in diameter on the upstream face of the dam should be cut even with the ground to prevent the eventual deterioration of the dam by root systems. All trees greater than three inches in diameter should be removed along with the root system. The subsequent holes should be filled with wall compacted material and seeded.

d. Place compacted fill in the area of the upstream face eroded by wave action, reseed, and protect with riprap at the wave line area.

e. Place compacted fill in all rutted areas, and grade so that the water will run off. Reseed as appropriate.

f. Reseed bare areas of present or potential erosion such as the bike trails to prevent progressive deterioration.

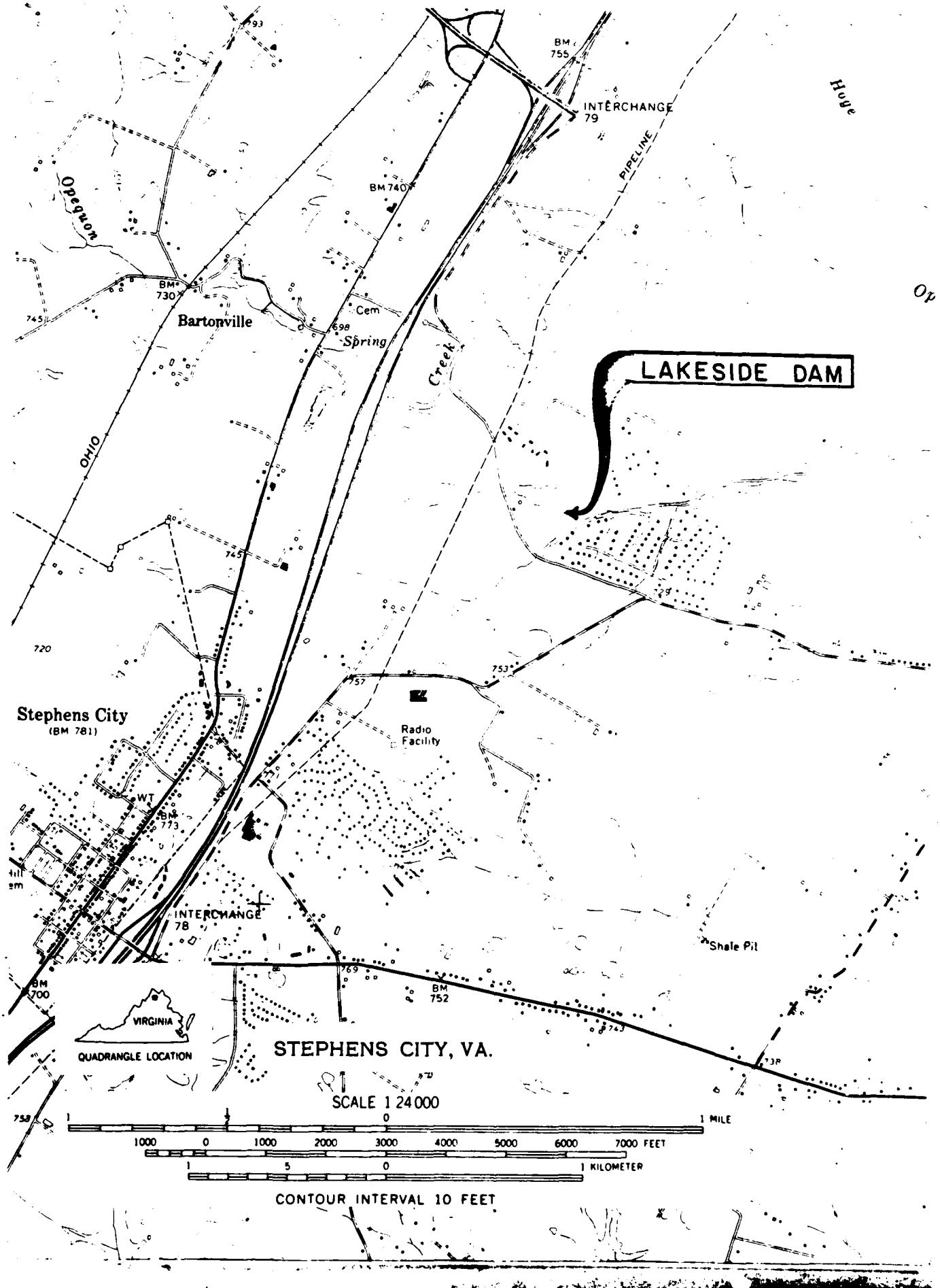
g. Remove the old boat in the approach to the spillway, and keep the area clear of vegetation.

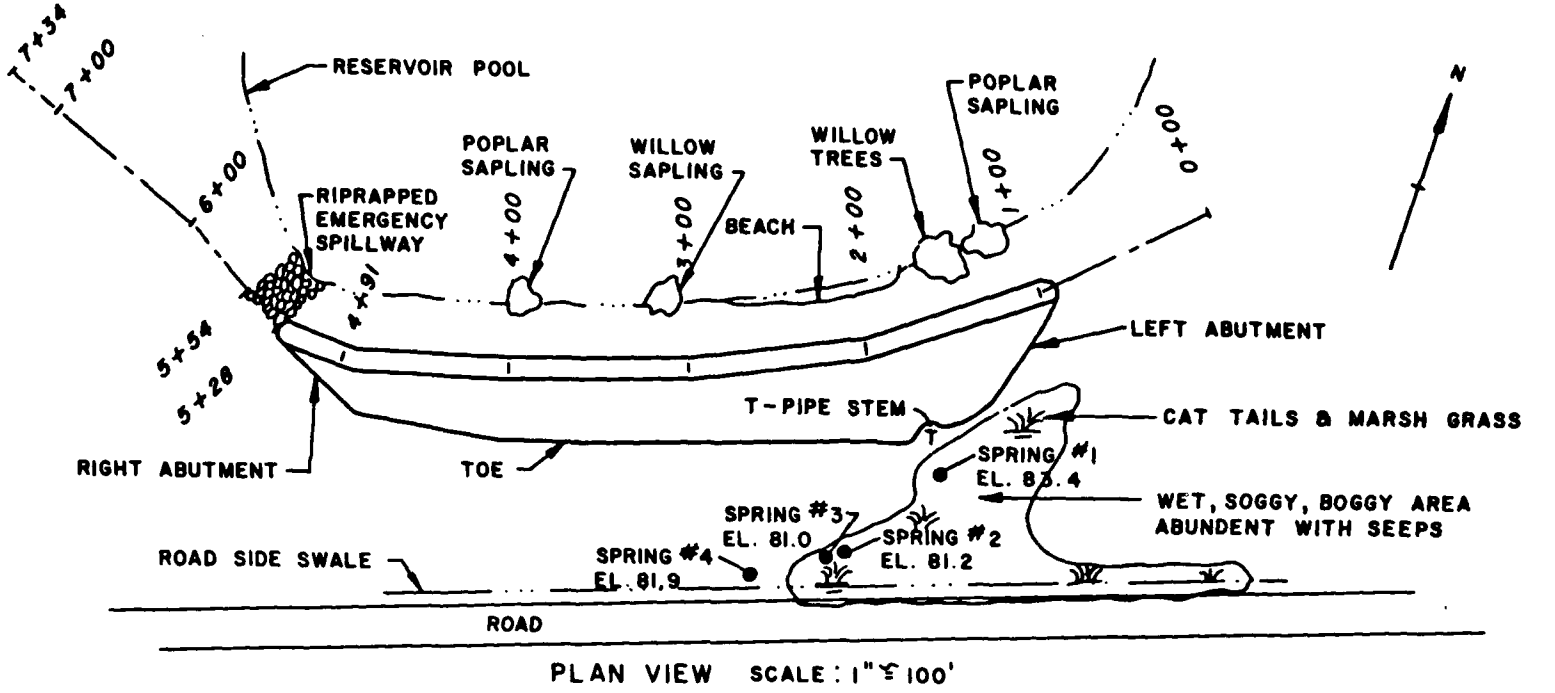
h. Continue mowing the dam area to maintain the grass cover and prevent the encroachment of underbrush.

i. Install a staff gage, which is a staff, rod, or post with elevations indicated on it permanently mounted in a lake to show the depth of the water. It should be of sufficient height to indicate the depth of flow through the emergency spillway.

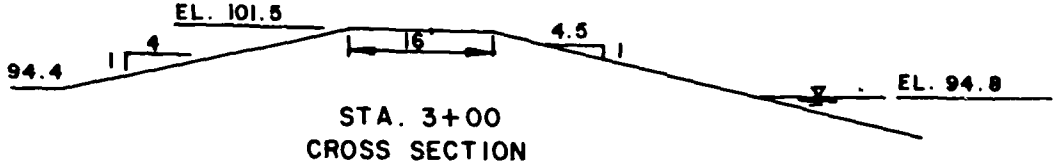
APPENDIX I

MAPS AND DRAWINGS

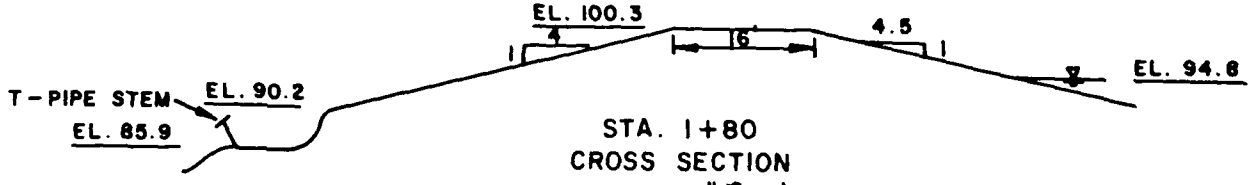

LAKESIDE DAM
Bartonville
Stephens City
(BM 781)
Opequon
OHIO
Creek
PIPELINE
INTERCHANGE
79
INTERCHANGE
78
BM 740
BM 730
BM 755
BM 752
BM 700
BM 773
Cem
Spring
Radio
Facility
Shale Pit
WT
VIRGINIA
QUADRANGLE LOCATION
STEPHENS CITY, VA.
SCALE 1 24000
1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 5 0 1 KILOMETER
CONTOUR INTERVAL 10 FEET



PLAN VIEW SCALE: 1" = 100'



STA. 3+00
CROSS SECTION
SCALE: 1" = 20'

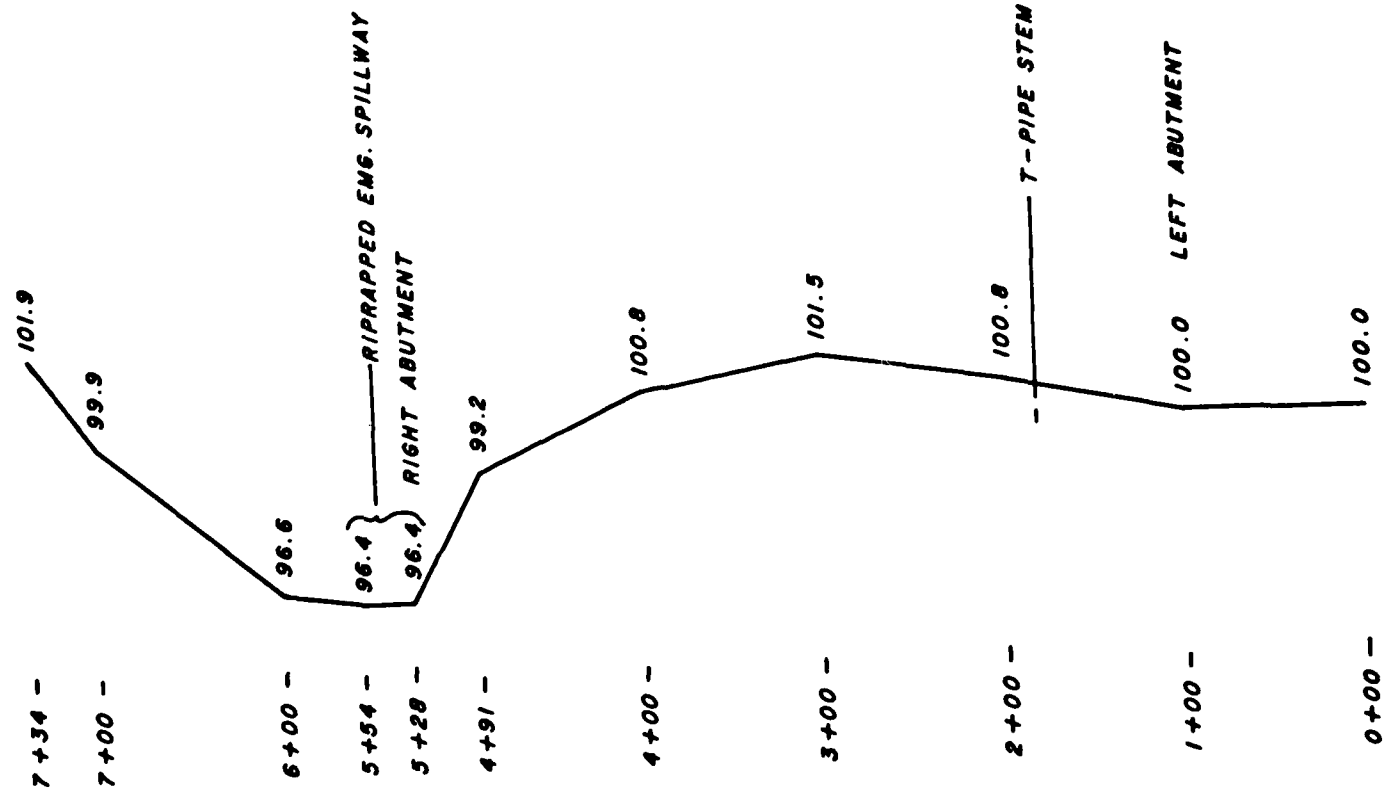


STA. 1+80
CROSS SECTION
SCALE: 1" = 20'

NOTE: 1. ELEVATIONS BASED ON TBM. TENNIS COURTS, SE CORNER POST, TOP OF CONCRETE FTG = 105.2

PEZZA
PLATE 1

LAKESIDE DAM
FREDERICK CO. VA
29 OCT 80



CREST PROFILE

SCALES H 1" = 100'
V 1" = 5'

NOTE : 1. ROAD IN RESERVOIR AREA @ 103.3.
PIPE INVERT @ 97.8

LAKESIDE DAM
FREDERICK CO. VA
29 OCT 80
PEZZA

PLATE 2

APPENDIX II

PHOTOGRAPHS

PHOTO # 1 CREST

PHOTO # 2 UPSTREAM FACE (IN FOREGROUND)

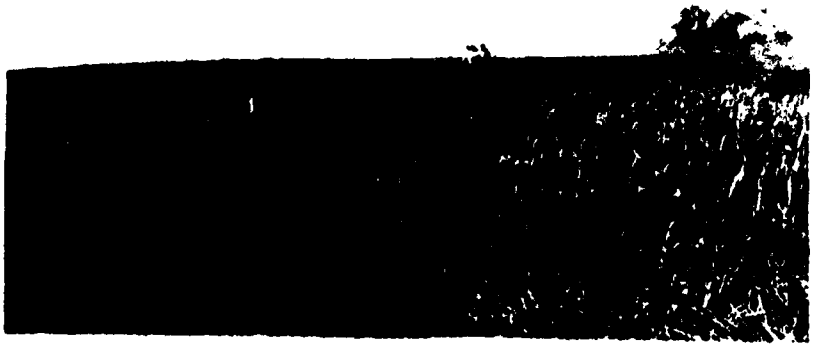


PHOTO #3 DOWNSTREAM FACE

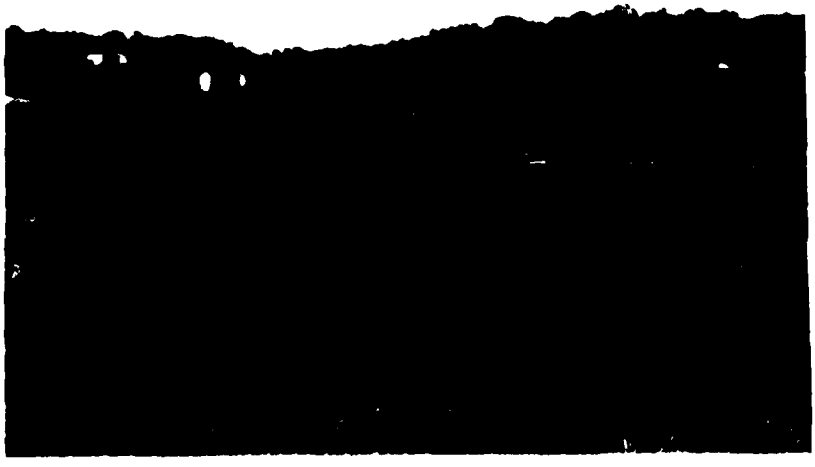


PHOTO #4 DOWNSTREAM FACE

PHOTO *5 THE SPILLWAY (STONE LINED)

PHOTO *6 THE SPILLWAY (STONE LINED)

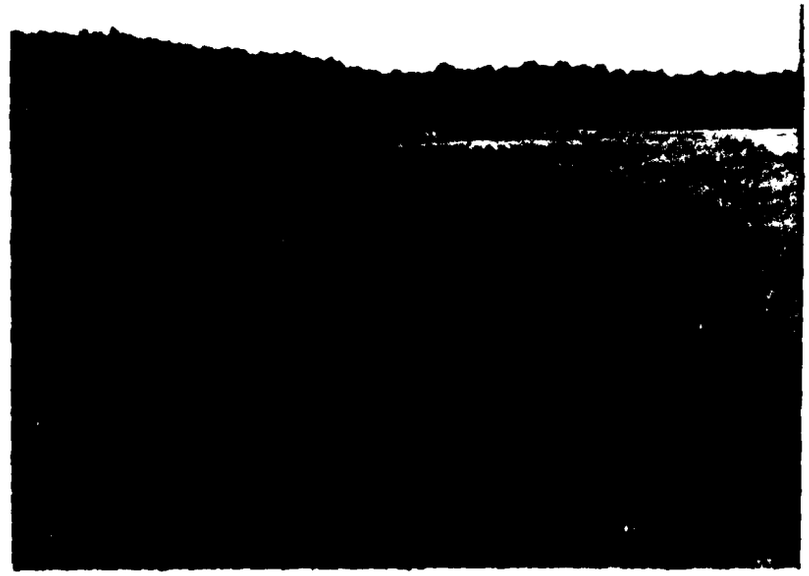


PHOTO #7 WET MARSHY/ BOGGY AREA
ON AND BEYOND D/S TOE

PHOTO #8 LOW LEVEL DRAIN OPERATOR
(NON-FUNCTIONAL)

APPENDIX III

FIELD OBSERVATIONS

Check List
Visual Inspection
Phase I

Name Dam: Lakeside Dam County: Frederick State: Virginia Coordinates: Lat. 3906.1
Long. 7811.4

Date of Inspection: 30 Oct 80 Weather: Clear and Mild Temperature: 55° F

Pool Elevation at Time of Inspection: 94.8 TBM Tailwater at Time of Inspection: None

Inspection Personnel:

D. Pezza, COE
J. Robinson, COE
B. Taran, COE
L. Jones, COE
D. Bushman, SWCB
H. Gildea, SWCB

H. Gildea Recorder

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	There is an eroded area on the upstream face near the center of the dam where wave action is eating into the embankment. There is a trail bike path on the left downstream face of the dam.	PLace compacted fill in the eroded area, reseed and protect with riprap at wave line. Reseed trail bike path to prevent erosion.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	There is no noticeable settlement or horizontal movement of the crest. There are tire ruts along the crest, which are quite deep and contain standing water near the left abutment.	Place compacted fill in the ruts and grade so that water will run off; reseed.
RIPRAP FAILURES	The riprap has failed in the eroded area mentioned above. The remaining riprap is not very well defined and has a great deal of vegetation growing throught it.	Place additional riprap as necessary after restoring eroded areas on the upstream face.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
FOUNDATION		
ANY NOTICEABLE SEEPAGE	There is an extensive swampy area below the dam on the lefthand side with standing water and several distinct seeps. Some seepage appears to be coming from the buried low level outlet. Other seepage may be from the reservoir or perhaps from natural springs in the area below the dam.	Monitor the seepage in this area for any change in color or rate of flow. Repair the low level outlet.
DRAINS	No drains are apparent.	
MATERIALS	Unknown.	
VEGETATION	There were several poplar and willow trees and saplings growing on the upstream face. Except in areas with erosion problems, the dam has good grass cover. There is a large growth of cattails on the upstream face.	Cut poplar and willow trees and saplings even with the ground to prevent eventual deterioration of the dam by root systems.

SPILLWAY AND LOW LEVEL OUTLET

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONTROL SECTIONS	The control section is riprapped. There are tire ruts to the left and right of the control section.	Fill and grade the tire ruts. Reseed where appropriate.
APPROACH CHANNEL	The approach channel has some cattails and tall grass growing in it. There is also an old boat in the approach channel.	Remove the old boat and keep the approach channel free of vegetation.
DISCHARGE CHANNEL	The discharge channel has tall grass growing in it.	Mow the area periodically to keep the channel free of grass and brush.
BRIDGE AND PIERS	*None*	
MISCELLANEOUS		
LOW LEVEL OUTLET	The outlet is buried and its exact location and size is unknown. There is an excavated area or depression with a "T" handle valve stem protruding. It appears that someone has attempted to uncover the outlet valve. There is a 4" cast iron pipe lying nearby.	Uncover and repair the outlet.

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATION
MONUMENTATION/SURVEYS	None	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
STAFFGAGES	None	Install a staff gage, which is a staff, rod, or post with elevations indicated on it permanently mounted in a lake to show the depth of the water. It should be of sufficient height to indicate the depth of flow through the emergency spillway.
OTHER		

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
	The slopes are gentle and well vegetated. The reservoir area of drainage is used variously for residential, recreational, and agricultural purposes.	
SLOPES		
SEDIMENTATION	Sedimentation was not measured.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The downstream channel consists of a trapezoidal roadway ditch which forms a portion of the bed of an intermittent stream. The channel is clear of obstructions.	
SLOPES	The slope of the channel is gentle and well vegetated, except in sections where it traverses bedrock exposures.	
APPROXIMATE NO. OF HOMES AND POPULATION	There is a subdivision beyond the road, with several homes that could be affected in the event that the dam should fail.	

AREA GEOLOGY

Frederick County lies within the Ridge and Valley province. The southeastern portion of the County, where the Lakeside Dam is located, is an extensive lowland, part of the Shenandoah Valley. The site is underlain by the Martinsburg Formation, which is characterized by brownish, fissile shale and thinly laminated, fine-grained sandstone. Outcrops in the area between the toe of the dam and the road noted during the inspection were of the brown shale, with a strike of N 35° E and a nearly vertical dip. The sandstone noted as typical of the Martinsburg Formation was observed only in the form of isolated boulders.

APPENDIX IV

REFERENCES

APPENDIX IV

REFERENCES

1. Recommended Guidelines for Safety Inspection of Dams, Office of the Chief of Engineers, Department of the Army, Washington, D. C.

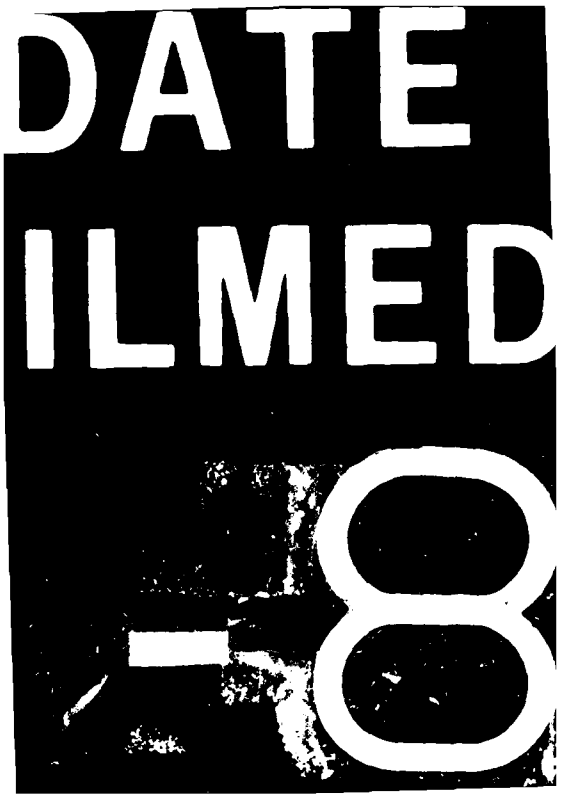
2. HEC-1 Flood Hydrograph Package, (Hydrologic Engineering Center, U. S. Army Corps of Engineers, January 1973.)

3. NWS-Dambreak Computer Model, (Office of Hydrology, National Weather Service (NWS), Silver Spring, Maryland, September 1980).

4. "Probable Maximum Precipitation Estimates, United States East of the 105th Meridian," Hydrometeorological Report No. 51, (National Weather Service, June 1978).

5. "Rainfall Frequency Atlas of the Unites States", Technical Paper No. 40, (National Weather Service, May 1961).

6. Bulletin 80: Geology and Mineral Resources of Frederick County, Charles Butts and Raymond S. Edmonson, (Virginia Division of Mineral Resources, 1966).


DATE
ILMED
8